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OUR REFERENCE
REG/als/G21144WO

YOUR REFERENCE

PLEASE REPLY TO
LONDON OFFICE

1 June 2005

European Patent Office
D-80298 Munich
Germany

By facsimile

Attn: Directorate General 2

Dear Sirs

Re: International Patent Application No. PCT/GB2004/003254
Sericol Limited

We refer to the written opinion dated 9 February 2005 which issued in connection with the above application. In response thereto, we are filing herewith, by way of amendment pursuant to Article 34 PCT, a new set of claims on pages 14-15 to replace the correspondingly numbered pages presently on file which are to be cancelled in their entirety. Claim 1 has been limited to incorporate the feature of claim 14, namely that the ink is an ink-jet ink. The amendments therefore has clear basis in the international application as filed.

With regard to item IV of the opinion, we should be grateful if we could defer consideration of unity of invention until the national/regional phases.

Regarding item V, the examiner raises a lack of novelty objection with regard to any one of D1-D3. However, none of these documents disclose an ink-jet ink and hence the present application, as amended, is novel over these documents.

With regard to inventive step, the present invention is directed primarily to ink-jet inks and hence the present application has been amended to incorporate this feature into claim 1. Ink-jet printing is different to other printing processes in that it is a non-contact printing technique allowing printing onto virtually any surface. Ink-jet printing is divided essentially into two distinctive techniques for generating the droplets of ink, i.e. continuous ink-jet printing and drop-on-demand ink-jet printing.

Continuous ink-jet printing involves exciting a jet of fluid by destabilising it in a controlled fashion to produce droplets. At the point of jet break-up, a charge is applied to each individual droplet as it passes through a charge electrode and the ink must be capable of holding on to this charge during flight through the print head. The charged droplets then pass between two deflector plates which are maintained at high voltage. The ink which is

not deflected and hence not used for printing is caught in a tube and may be recycled. Drops which form the image are deflected by the deflector plates to the required area on the substrate. In contrast, drop-on-demand printing is characterised by the fact that droplets are only produced when required for printing and, in general, droplets are produced by an ejection mechanism, typically using a piezo crystal, rather than destabilising a jet. An ink-jet ink must always remain fluid within the printing head and must not be allowed to dry in order to prevent clogging. The ink must also be able to dry quickly on the substrate once printed. The ink must also have a sufficiently low viscosity and sufficiently low particle size to pass through the ink-jet printing head nozzle without causing a blockage. These physical parameters are tailored specifically for this application.

The Printing Ink Manual 5th Edition, Ed. R. H. Leach and R. J. Pierce, 2002 explains under the heading "Designing and Testing an Ink" that:

> "[T]he design of a range of inks to withstand the rigours of ink-jet and produce a wide variety of properties once printed is no ad hoc process. Experience, good scientific understanding and investment into research are all necessary. Reliability is a key requirement for all equipment on production lines and ink-jet is no exception."

The high accuracy and higher speed required in new applications of ink-jet technology place further burdens on the ink. Modern ink-jet printing jets and droplets are formed at extremely high speeds. The fluids used contain significant amounts of polymer and/or particulates and have complex rheological properties. The high printing speeds and complex rheological properties leads to complex and poorly understood behaviour. The skilled person is therefore well aware that formulations which work in any given application will not necessarily work in ink-jet printing.

With this in mind, we have the following comments regarding D1-D3.

D1 is the applicant's own prior art and relates to a screen printing stencil. Screen printing employs a stencil which forms an image on the screen which is placed over the substrate and a squeegee is used to push ink through the stencil onto the substrate. The resin for the stencil is applied to the screen and then selectively irradiated to form the image. The resin must be hardenable on exposure to irradiation and must allow non-irradiated parts of the composition to be washed away. The demands on the rheological properties of the resin and on the curing properties of the resin are significantly different than for ink-jet inks.

Firstly, the viscosity of a composition for a screen-printing stencil must be high in order to prevent "drip through", i.e. dripping of the composition through the holes in the screen itself. Simply changing the viscosity profile would not be viable given the complexity of an ink-jet ink since changes to the viscosity may have a significant effect on other aspects of the ink. Indeed, the presence of the polymer backbone in the component claimed in claim 1 of the present invention would be considered to have a deleterious effect on the rheological profile of an ink-jet ink, and the skilled person would certainly not be able to predict its effect on the rheological properties of an ink-jet ink.

Secondly, the curing profile of a screen-printing stencil is different to an ink-jet ink. A composition for a screen-printing stencil will be exposed to a stronger UV light source and will have longer exposure times, typically many tens of seconds compared to a fraction of a second and with a weaker UV source for ink-jet printing. Thus the skilled person would

have no reason to believe that the components of a composition for a screen-printing stencil might be applicable as an ink-jet ink. Moreover, the skilled person would be likely to consider that pendant cross-linkable groups on a polymer backbone would not have sufficient sensitivity for use in a curable ink-jet ink.

A skilled person considering D1 would not, therefore, consider using this technology in an ink-jet ink with any expectation that it would meet the stringent requirements of this printing technique. Indeed, a skilled person would have no reason to consider that such components could be incorporated into an ink-jet ink without the benefit of hindsight from the present application.

D2 also relates to a photosensitive resin composition and at column 11 under "Utilization of Composition" indicates that the photosensitive resin may be used as a photosensitive material for a screen-printing plate, see lines 26-28. There is, however, no indication that the particular photosensitive resin composition disclosed in D1 could be used in an ink, and certainly no indication that it could be used in an ink-jet ink. There is an indication in the background of the invention under the description of the prior art that photosensitive resin compositions in general may be used as vehicles for paints and printing inks, see lines 11-13. All inks will contain a pigment and a binder in a liquid vehicle and we do not dispute the disclosure in D2 that photosensitive resin compositions may be used as vehicles for printing inks. However, there is no indication that the specific resin disclosed in D2 may be used for this purpose and certainly no indication that the specific resin might be applicable for ink-jet inks. Indeed, a skilled person taking the teaching of D2 as a whole would understand that the resin is applicable for use as a photosensitive material informing a stencil in screen printing, but not as an ink. By specifying that the photosensitive resin composition finds utilization as a stencil, D2 actually teaches the skilled person away from using this resin as an ink, and certainly as an ink-jet ink. We therefore submit that the present invention is inventive over D2.

D3 is also the applicant's own prior art. Similarly to D1, this application relates to a stencil for screen printing and not to an ink. Example 4, which is mentioned by the examiner, indicates that the composition "gave satisfactory stencils", see page 9, line 2. Since there is no disclosure of an ink in this document, and certainly no disclosure of an ink-jet ink, the present invention is inventive over this document.

We submit that all of the objections raised under item V in the opinion have now been met.

Yours faithfully
Elkington and Fife LLP

Richard Gillard